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A COMPARATIVE ANALYSIS OF THREE WORKLOAD REPORTING SYSTEMS, AN
ACTUAL OBSERVATION SYSTEM, A PROSPECTIVE CONCURRENT SYSTEM
AND A RETROSPECTIVE SYSTEM IN AN ARMY MEDICAL CENTER

A Graduate Research Project
Submitted to the Faculty of
Baylor University
In Partial Fulfillment of the
Requirements for the Degree
of
Master of Healthcare Administration

By
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In completing this research project, it became very obvious that most research projects cannot be accomplished in a vacuum by only the researcher and his pen. Research is an arduous and exhausting process of recording, collecting, analyzing, summarizing, and finalizing data into an intelligent manuscript of information to the reader. It is likewise obvious that this research project could not have been completed without the help of the following people: COL Marion Walls, the chief nurse at Brooke Army Medical Center; the headquarters nursing staff, including the head nursing researcher, COL Joseph Maloney; the head nurses and all nursing personnel on wards 12A, 12B, 42E, and 43B; Mrs. Patricia Twist; and Dr. Dave Mangelsdorff at Health Care Studies and Clinical Investigation Activity. A very special and sincere thanks goes out to LTC(P) Wayne Sorensen, LTC John Coventry, LTC Valerie Bisky, and LTC Marti Bell for diligently inspiring me to obtain my goals and ensuring that I stayed organized throughout my residency period. All of these people kept my spirits high and never let me deviate from my ultimate goal. My sincere appreciation and thanks go out to each and every one of them for their cooperation and support.

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CHAPTER I

INTRODUCTION

In every sector of health care, it has been the goal of health care administration and nursing administration to efficiently and effectively match nursing resources to patient requirements. The variations and complexities of patient requirements for nursing care, the critical nature of time constraints to meet patients' needs, and the associated costs required to adequately finance patients' needs have all affected the necessity to quantify the workload generated by hospitalized patients. Out of this vital need to appropriately manage nursing resources have come various forms of patient classification systems and workload methodologies.

Patient classification systems and workload methodologies have been especially useful in the field of hospital administration for the last 20 years. One valuable use of patient classification systems is to effectively allocate nursing resources to inpatient services within a hospital. Another important use of patient classification systems is to monitor and assess the outlay of funds used in the process of providing patient treatment. Many past studies have shown how different healthcare institutions develop their individual patient classification systems in order to determine which system is the most advantageous to use in a particular hospital.

In many of the hospitals in the civilian sector, nurse staffing requirements are calculated based on the retrospective collection of actual

work procedures performed by hospital nursing personnel using patients' medical record. The amount of workload actually performed is used as an input in the calculation of the appropriate staffing levels and the costing of services based on predesigned staffing tables. As Jelinek (1985) states: "There is an increasing interest in determining the specific cost of nursing care in agencies that provide separate billing for each patient service utilized" (p. 82).

In contrast, the current Army healthcare system's method of determining hospital nurse staffing requirements is based on a futuristic look at physicians' orders and treatment therapies. This method, known as the Prospective Concurrent Patient Workload Classification System (PCPWCS), is a workload classification system which is used to project workload expected to be performed by nursing personnel (see Appendix A). The PCPWCS utilizes the Patient Acuity Worksheet (PAW) to record information (see Appendix B). The PAW is an approved survey instrument from Health Services Command (HSC) and the Office of The Surgeon General (UTSG) that categorizes patients using critical indicators to measure the amount of nursing care the patient will need during the following 24-hour period. PAW data are used with the PCPWCS to calculate the number of nursing personnel to be staffed in a particular service or department. The PCPWCS was derived from staffing tables developed during a joint services study and published in the Army-Navy (1985) workload management system manual Workload Management System for Nurses. Questions as to the most accurate system to quantify nursing workload provided to patients still remain.

In today's healthcare market, managers are undoubtedly questioning the correct level of ancillary healthcare personnel needed to effectively

maintain quality of care. At the same time, these healthcare managers wish to utilize only the minimum numbers of ancillary personnel to be as efficient as possible in their healthcare organization. Many health care professionals are genuinely concerned that the prospective concurrent patient workload classification system of calculating workload procedures expected to be performed by nursing personnel is not an accurate representation of the actual work procedures performed. Therefore, it may be an incorrect measure of workload.

In order to determine if the PCPWCS method is a valid representation of the workload which is actually performed, a retrospective audit of the nurses notes found in the inpatient record must be tabulated using the PAW. However, as shown by researchers such as Cherkin, Phillips, and Gillanders (1984) and Lloyd and Kissing (1985), many errors or deficiencies in information can exist throughout the patient's medical record. Therefore, a determination must be made as to the actual events that transpired through concurrent recording of the treatments given by the nursing personnel. The use of the term actual is defined as what treatments were, in reality, given to the patients. Then a comparison can be made between the PCPWCS, the retrospective medical record audit of nursing workload performed, and the actual tasks which occurred during the nursing treatments.

Problem Statement

The purpose of this descriptive study was to determine if there was a statistically significant difference between the numerical point values

obtained while measuring workload related to individual patient care in various critical indicators using the Army's Patient Acuity Worksheet during: (1) a prospective concurrent patient classification review, (2) a retrospective patient classification review of the patient's medical record, and (3) the actual recording of events and classification of patients by nursing volunteers which occurred during nursing treatments across multiple services in an Army medical center.

Objectives

The objectives of this study were to:

1. obtain the prospective workload classification scores of a randomly selected group of patients using the Patient Acuity Worksheet for a subsequent 24-hour period.
2. obtain the actual workload classification scores of the same group of patients by recording the actual treatments rendered to the same patients on the PAW by volunteer nursing personnel during the same 24-hour period as the prospective workload classification was performed.
3. obtain the retrospective workload classification scores of the same patients on the PAW during the same 24-hour period by personally reviewing their patient medical records using the PAW for the same 24-hour period with the aid of a qualified nursing researcher.
4. determine the comparative relationship between the prospective concurrent patient workload classification scores, the retrospective patient workload classification scores, and the scores obtained during the actual recording of treatments rendered by nursing personnel using the

appropriate statistical tests.

Criteria

A total of 31 medical-surgical patients were randomly selected from four medical-surgical wards at Brooke Army Medical Center (BAMC) which were scored by selected raters using the PAW. In order to determine if a statistically significant relationship existed between the prospective concurrent patient classification scores, the retrospective patient workload classification scores, and the actual recorded treatment scores, a one-way analysis of variance (ANOVA) test was performed on the total scores for each patient by each rater on the Patient Acuity Worksheet. When a statistically significant difference was found to exist at the .05 level of significance, then Tukey's Honestly Significant Difference Test was performed on the individual critical indicators for each patient on the PAW to determine the strength the relationship between the three methods of measuring patient treatment workload. After the statistical analyses had been completed, an in-depth qualitative analysis was performed to explain any noted differences.

Assumptions

For purposes of this research project, it was assumed that:

1. The patient records needed for the retrospective audit research would be available to this researcher in a timely manner.
2. The information collected from the randomly selected records

for the prospective and the retrospective scoring would be correct and complete with the appropriate treatment information documented.

3. The Patient Acuity Worksheet to be used as a patient classification tool would continue to display the high validity and reliability that had been documented in research studies conducted by the Army and the Navy (BAMC Nursing Training Division 1987).

4. The military patient record used as a research tool would approximate the reliability of the civilian patient record currently reported in various civilian and military literature (Lloyd & Rissing, 1985).

Limitations

The research project was constrained by the following:

1. The researchers who perform the prospective scoring and the actual recording of workload data were different researchers than the one who performed the retrospective scoring. Past research studies from BAMC Nursing Training Division (NTD) and other nursing researchers have shown that this change of data collectors affects the continuity and uniformity of the data (Ebener, 1985 and Giavannetti & Mayer 1984). This data collection technique was used to eliminate a previous knowledge bias which can occur when the same rater scores each phase of the PAW. However, the use of different raters was considered to be a limitation that can ultimately affect the uniformity of the recorded data.

2. The research was performed on four BAMC wards. The wards were picked by the BAMC nursing workload staff officer in order to minimize

disruption to patient care, to use wards with 80% or greater reliability ratings and the cooperative nature of the four wards utilized. This selective process produces certain biases to the study. Additionally, the results of this study are applicable only to BAMC, and additional research by subsequent investigators may be required at BAMC and at other military installations in order to determine the capability of generalizing this study's conclusions.

3. The use of the medical record as a valid source of documentation of patient treatments rendered was limited by the availability of the record and accuracy of the entries in the patient record.

4. The use of some volunteers was necessary to collect data for the prospective and the actual nursing treatment observations. The extent to which different personnel could be utilized to collect nursing workload data was subject to the experience levels of those volunteers.

Review of the Literature

During a comprehensive review of the literature, several articles were found that noted the development of patient classification systems throughout medical history (e.g. Alward 1983, Auger & Dee 1983, Jelinek 1985 and Scherer & MacKenzie 1980). Giovannetti (1979) reported that nursing interest in patient classification and nursing acuity ranges from basic research to refinement and implementation of various forms of patient classifications. The most common purpose of patient classification is to determine the appropriate mix and volume of nursing care necessary to provide patient treatment.

The literature researched provided vast information on the multiple factors that affect the selection of a patient classification system (e.g. Award 1983, Ebener 1985, Jackson & Kesnick 1982 and Slyck 1985). Two significant factors in determining which patient classification system to use are the reliability and the validity factors (Ebener 1985). Ebener states

to be credible and useful, a PCS (patient classification system) must be reliable and valid. Reliability and validity are not independent characteristics of an instrument. An instrument that is not reliable cannot possibly be valid. If an instrument offers inconsistent and erratic results, the instrument cannot validly measure the characteristic being studied (p.325).

As stated in the final report on the Workload Management System for Nurses, the PAW was found to be structurally valid 81% of the time (Rieder & Jackson, 1986 p. 3). However, determination still needs to be made as to whether the PAW is equally valid during prospective, concurrent, and retrospective collection periods.

The literature continues to display a wide variety of patient classification systems, but very little could be found concerning the study of the comparison of the PAW in the prospective, actual and retrospective phases. Some information concerning the reliability and validity of the PAW was found in the various studies used in the development of the PAW by the Army and the Navy as part of the Workload Management System for Nurses (Rieder & Jackson, 1984, 1985, 1986). The literature does illustrate the validity of other patient classification systems against actual nursing care hours needed. For example, Marks (1987) showed that the average hospital predicts 2.6% more nursing care hours than are actually required

by the patients (p. 41). In addition, the literature addresses the use of some form of prospective system which is audited by a records review or a limited observation of patient treatment (e.g. Billings 1983, Johnson 1984 and Marks 1987), but never a comparison of all three phases of the patient classification system. Jackson and Resnick (1982) do show a comparison of some patient classification systems, but they generally recommend tailoring the system to one's particular hospital instead of a patient classification system that can be used at multiple hospital sites. Additionally, Billings (1983) introduces a system which can only be used in a critical care area where a patient's status and requirements frequently change with little or no notice.

Johnson (1984) stresses the need to keep the patient classification system simple and easy to implement. Alward (1983) recommends movement from the complex reality of the present nursing classification systems to future ideal systems which are valid, as well as reliable. Edmunds (1982), Packer (1985), and Whiting-O'Keefe, Simborg & Warger (1985) discuss the computerization of the patient record and the way in which information can be kept more accurately and more efficiently. Adams and Duchene (1985) state that patient acuity system and nursing care planning can and should be completely computerized. "Precise identification of patient needs, accurate accounting of nursing care receives, and a knowledge of staff salaries enable direct cost accounting of nursing care (p. 11)."

The Army Medical Department does utilize computerized hospital information systems at some of their large medical centers and medical activities such as the Hospital Information System (HIS) at William Beaumont Army Medical Center and the Uniform Chart of Accounts Personnel

Utilization System (UCAPERS) at Darnall Army Community Hospital at Fort Hood. However, these systems do not provide the on line access and support to the nursing staff in order to identify acuity levels and workload in a timely manner (personal communication with Colonel Joseph Maloney). While the Army Medical Department is constantly investigating and testing various systems, there still needs to be further research accomplished in the areas of on line nursing classification systems with complete access to the ward nursing personnel to support the increasing requirements for documentation and treatment records.

Research Methodology

Various types of research methodology were discussed with nursing researchers from the HSC Health Care Studies and Clinical Investigations Activity and BAMC Nursing and Education and Staff Development. A decision was made to utilize the existing data collected by head nurse researchers on four BAMC medical-surgical wards that displayed a history of .80% reliability ratings or higher on the prospective classification of their patients. From the four wards, two twenty-four hour periods of data on patients were randomly selected to use for the actual and retrospective periods of the study at BAMC. The existing patient classification tool and scoring data were selected because of their proven reliability rating of 0.80 or higher obtained during a joint services study conducted by the Army and the Navy (Williams et al., 1983). In addition, different researchers performed the prospective and the retrospective scoring of the inpatients on the BAMC medical-surgical wards. This technique was used to help

eliminate a previous knowledge bias, which can occur when the same rater scores each phase of the PAW. The following steps were performed in conducting this graduate research project:

1. From the existing pool of patients residing on the fourteen medical-surgical inpatient wards of BAMC, two twenty-four hour periods of prospective data were randomly drawn to obtain a sample of 81 medical-surgical inpatients from four medical-surgical wards, 12A, 12B, 42E and 43B. The four medical-surgical wards were selected by BAMC Nursing Education and Staff Development due to the historically high reliability rates and the cooperative nature of the four wards. Additionally, disruption of patient care would be minimized on these four wards compared to other patient care wards at BAMC. From this sample, actual nursing treatment events were observed during the two 24-hour periods used to score the patient treatment workload on the PAW.

2. All of the actual recorded treatment data were collected by ward nursing personnel assigned to the various BAMC wards.

3. A retrospective audit of the same sample of patients was performed for the same two 24-hour periods on a PAW using the nursing notes and patient treatment information maintained in the patients' medical records.

4. A nursing researcher verified the reliability of the retrospective scoring accuracy on the PAW to ensure a reliability rating of at least 0.95% accuracy.

5. After patient scores had been collected, a one-way ANOVA Test was performed on patient total scores and the eight critical indicators of patient treatments on the PAW, using an alpha level of significance of 0.05 to determine if a statistically significant difference existed among the

prospective scores, the retrospective patient record audit scores, and the actual recorded nursing treatment scores on the three groups of PAW.

6. A Tukey's Honestly Significant Difference Test was then performed on the scores of the eight critical indicators and the total scores for the three methods of workload collection.

7. A qualitative analysis was performed by interviewing various nursing personnel on the four wards researched and the BAMC nursing researchers.

8. Alternative ways to collect nursing workload were explored and discussed with the nursing researchers to formulate possible solutions and recommendations.

CHAPTER II

Discussion

Nursing Workload Management and the Patient Acuity Worksheet

The patient acuity worksheet used for nursing acuity has been used for approximately 3 years at BAMC. However, the medical center has experienced a large turnover of personnel using the PAW, and it is necessary for the BAMC Nursing Education and Staff Development to frequently train and check the reliability of the nursing personnel. The reliability ratings for three of the four wards used for the research project was rated at over .80 for March 1987; suspect data from the fourth ward were

discarded where nursing personnel admittedly failed to document all patient treatments given during the research period (personal communication, LTC Norma Hurtado, 14 May, 1987). The reliability and the participation were anticipated to be extremely high for the four wards chosen for data collection. The nursing personnel on all four wards have had a great deal of experience with the PAW and nursing acuity.

Preparation for Data Collection

Permission to perform the research was obtained from the BAMC Commander, the Deputy Commander for Administrative Services, the deputy Commander for Clinical Services, the Chief Nurse and the Chairman of the Institution Review Board. Next, the head nurses of the four medical-surgical wards were contacted to elicit their cooperation in collecting the actual treatment data for this research project. A specific time was scheduled with each ward to provide a presentation on all phases of the research study to all nursing personnel working on the ward who would be treating the patients and subsequently collecting the patient data on the PAW. Each ward nursing staff was instructed on how to collect the appropriate treatment data on each patient using a PAW which was slightly modified to make data collection easier for the three shifts of each ward (see Appendix C). The original PAW had the number of times a treatment or task had to be performed before credit could be taken for the task. The original PAW was modified to alleviate the need for the nursing personnel to know how many times a particular type of treatment had been given in order to score the PAW. For example, information such as TID or QID or

Q-Shift was erased from the original PAW and the personnel were instructed to place a check mark or a line mark by a particular task to indicate that the task had been performed once. In this way, the nursing personnel did not have to worry about what other nursing personnel had done prior to their patient treatment tasks to determine whether or not they should take credit for a particular task. The nursing personnel were told that the PAW's would be collected at the end of the research periods and the PAW's would be assigned the appropriate point values. The nursing personnel were given enough PAWs to place one on each patient's bedside table for both research collection days. The two dates of collection were March 16-17 & March 18-19, 1987 from 7:00 am to 7:00 am the next day. The personnel were told that this researcher would collect the PAWs at the end of each 24-hour period.

Data Collection Period

The researcher visited each ward several times during the two 24-hour periods to ensure proper data collection. Through observations of and interviews with nursing personnel, and after close scrutinizing of the actual data collected on the PAWs, it was determined that some PAWs had to be discarded due to non-compliance with data collection instructions. After discarding improperly collected PAWs, the remaining number of PAWs to use for research was 81. Each prospective PAW filled out by the head nurses on each ward on the 81-patients sampled was copied to use for research comparisons. The copying of the prospective sheets was accomplished on each ward during a one week period. The next step was to collect the

retrospective information from the patient's medical record and to record the information onto the PAW. The accuracy of correctly scoring each retrospective PAW was monitored by a BAMC nursing researcher, who judged the accuracy at or near 100%. The actual collection of the retrospective data from the patient treatment records was accomplished over a two week period. The majority of time involved locating and recording patient record information.

Analysis, Interpretation and Results of Data Collected

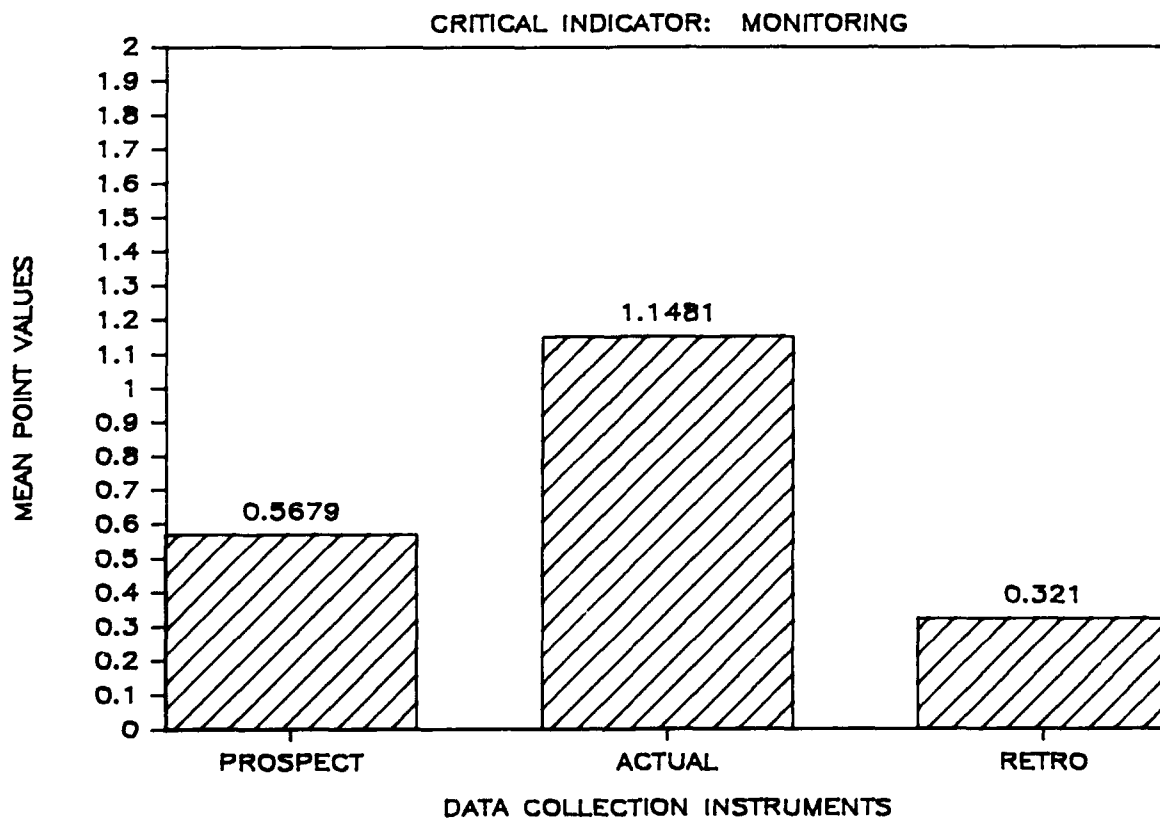
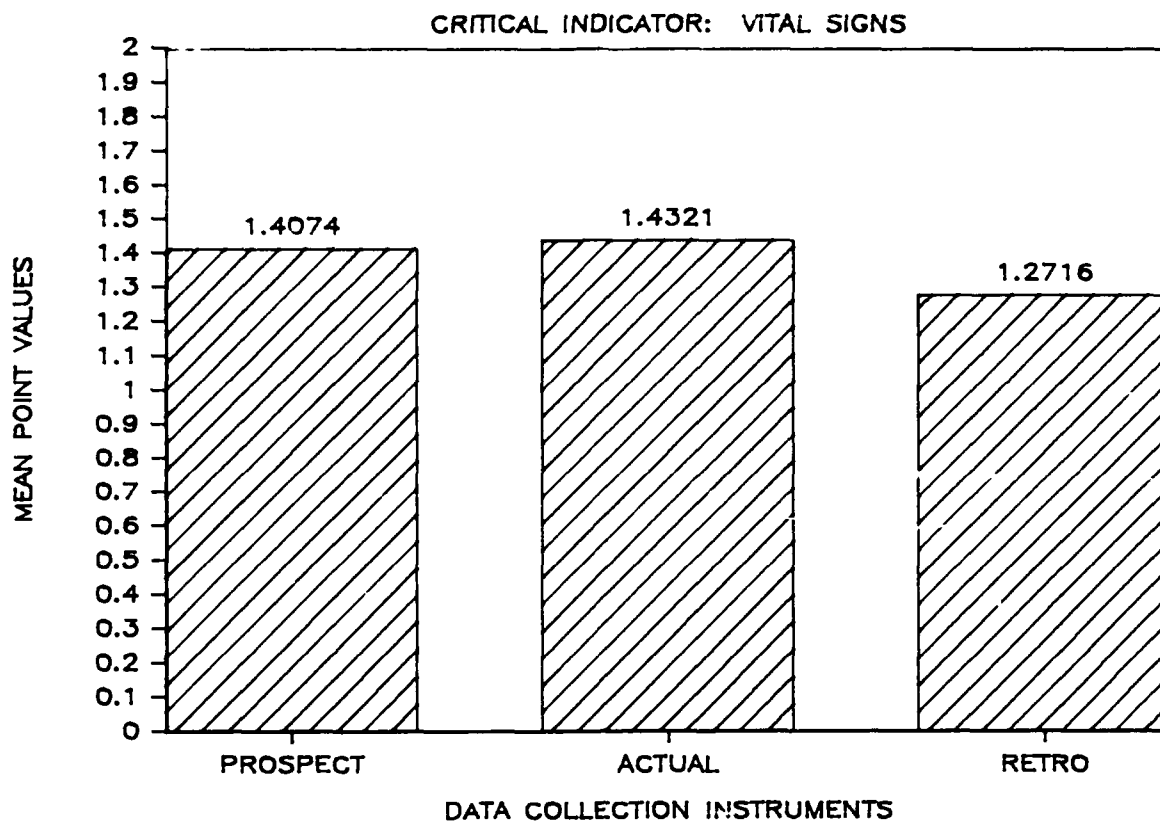
After scoring the retrospective PAWs from the patient treatment records; all prospective, actual, and retrospective PAWs were totaled by each of the eight critical indicators and by grand total. Each patient's prospective, actual, and retrospective PAWs was matched with its counterpart and the scores entered into a computer terminal for statistical analysis. Several statistical analyses were performed on the data including, a one-way ANOVA and Tukey's Honestly Significant Difference (HSD) Test. The ANOVA performed on the numerical scores on prospective, actual, and retrospective data showed significant differences at less than the .05 level for the asterisked (*) critical indicators shown in Table 1. Four out of five critical indicators and the total scores of the critical indicators on the PAW showed signs of significance at the .05 level or greater. Figures 1-9 display the mean point values on the PAW by critical indicator and by total for each data collection instrument. The point values equal one point for each minute of nursing care provided. After discovering that the results of the ANOVA demonstrated that significant

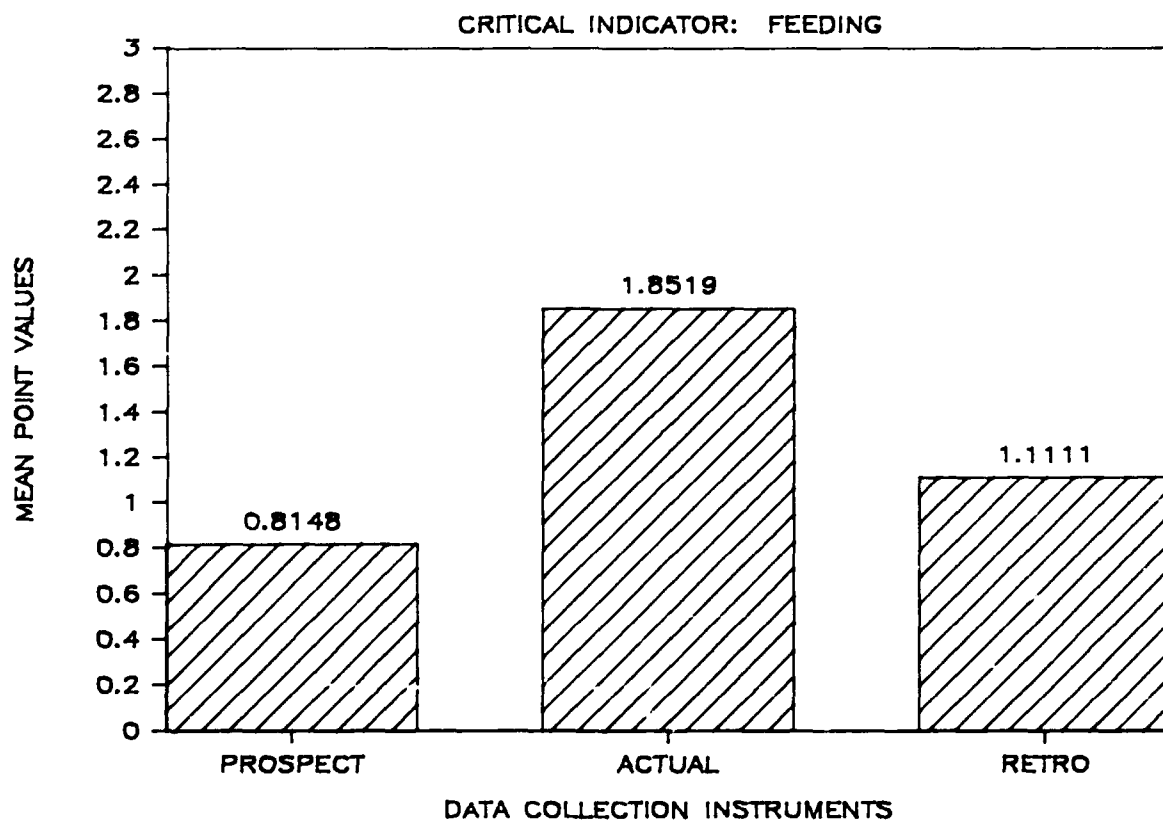
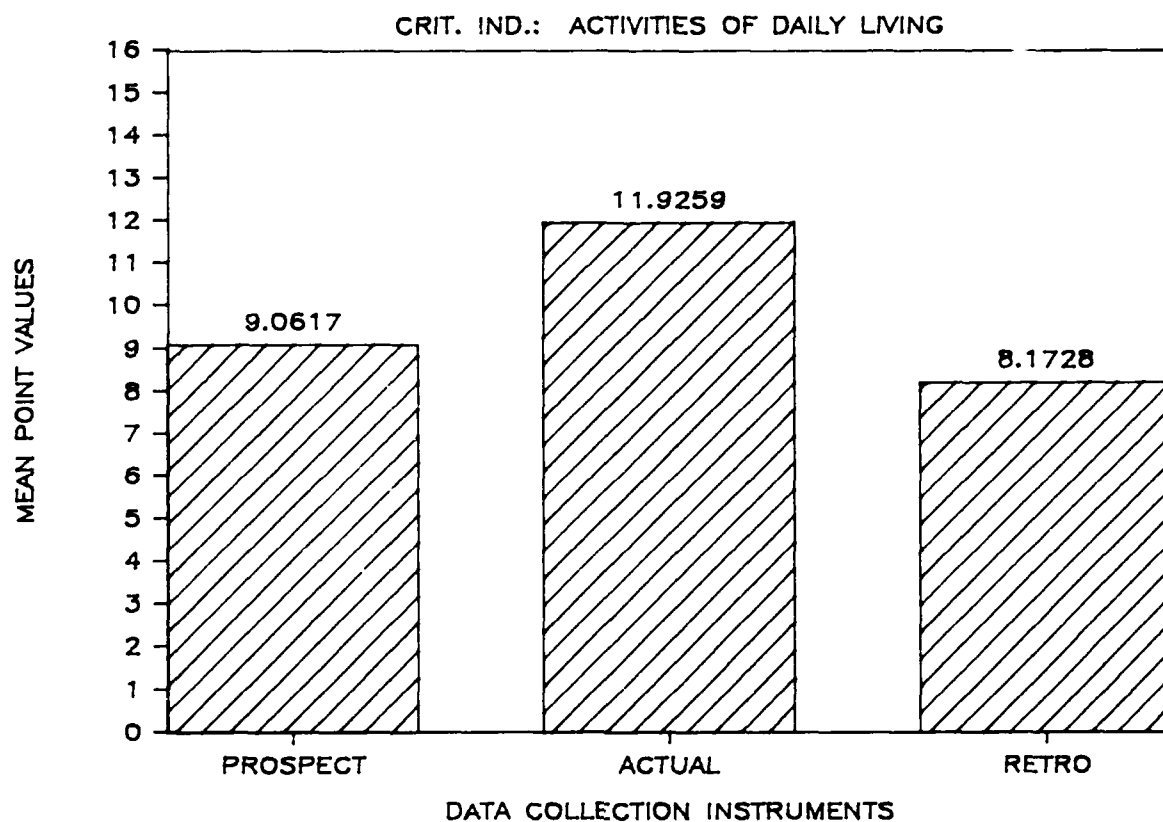
Table 1.
Summary Data of the Analysis of Variance Test

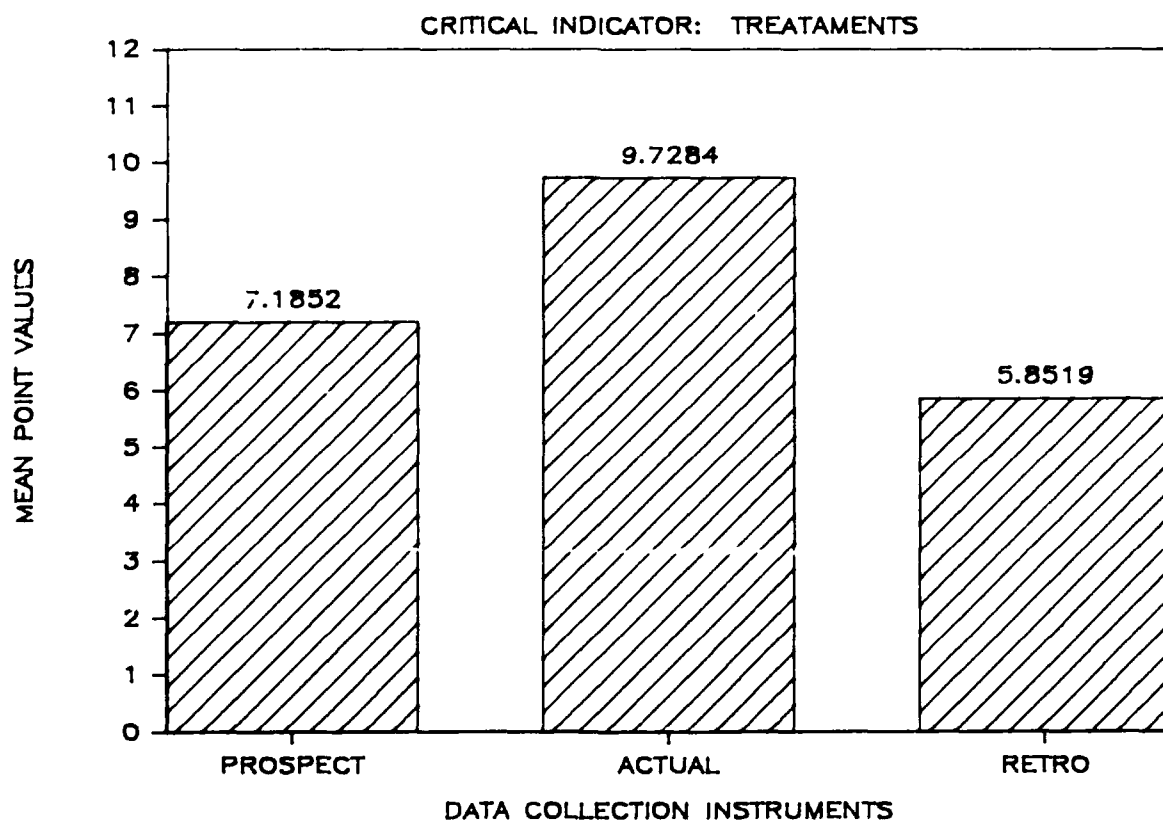
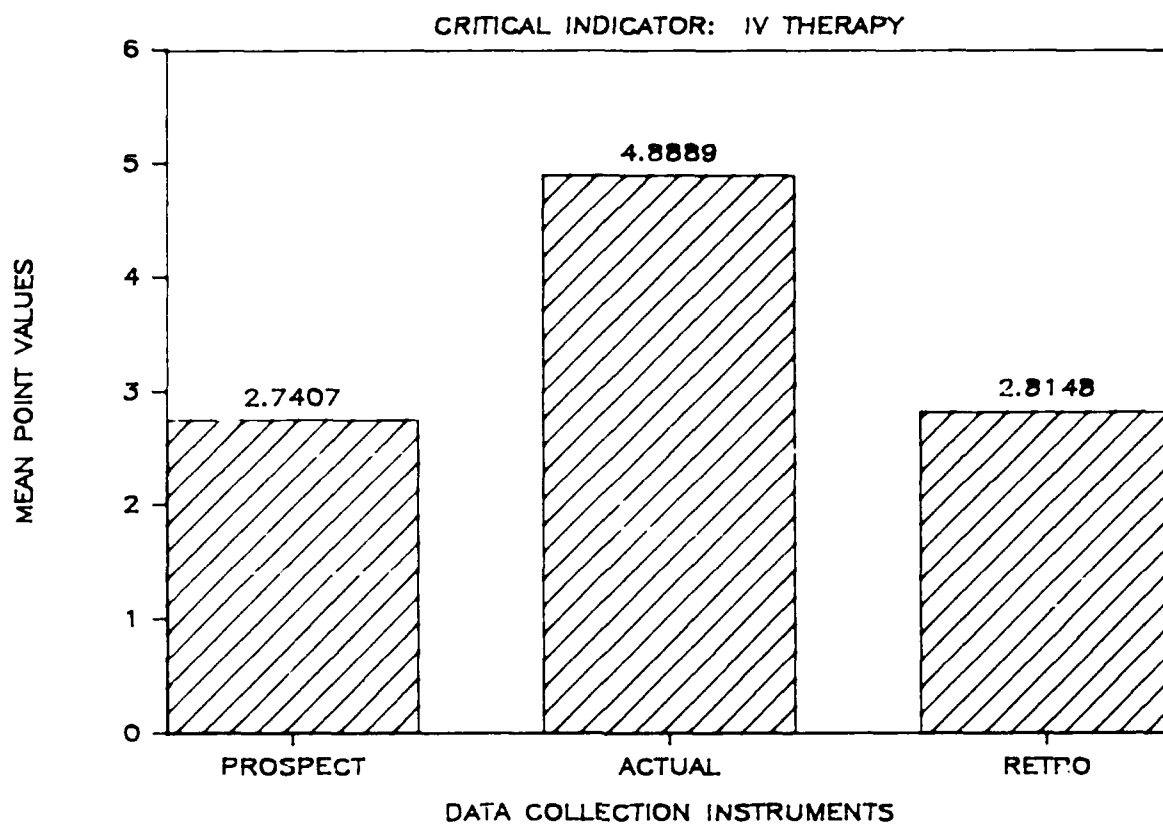
Critical Indicators	d.f.	F Value	Significance of F	p < .05
Vitals	2/242	1.157	0.316	
Monitoring	2/242	10.197	0.001	*
ADL	2/242	1.873	0.156	
Feeding	2/242	1.891	0.153	
IV Therapy	2/242	5.109	0.007	*
Treatments	2/242	5.256	0.006	*
RT	2/242	2.007	0.137	
Teaching	2/242	41.407	0.001	*
Totals	2/242	16.109	0.001	*

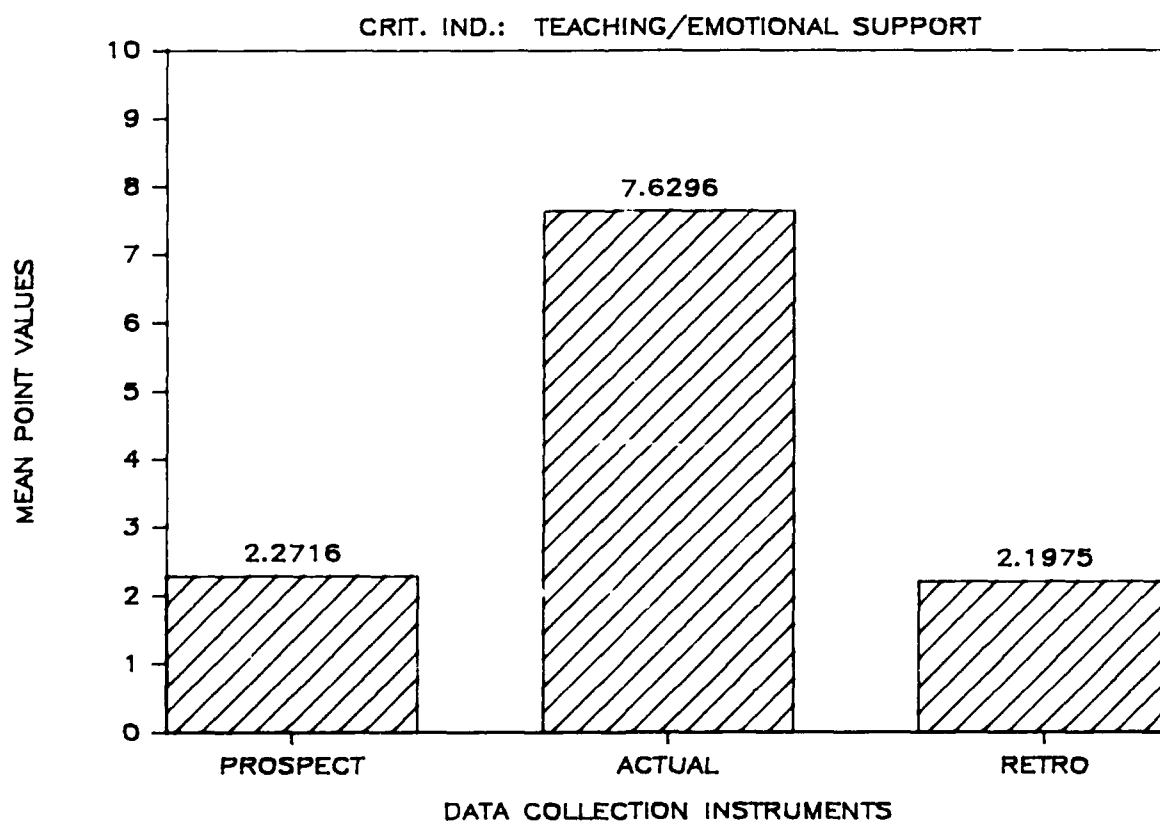
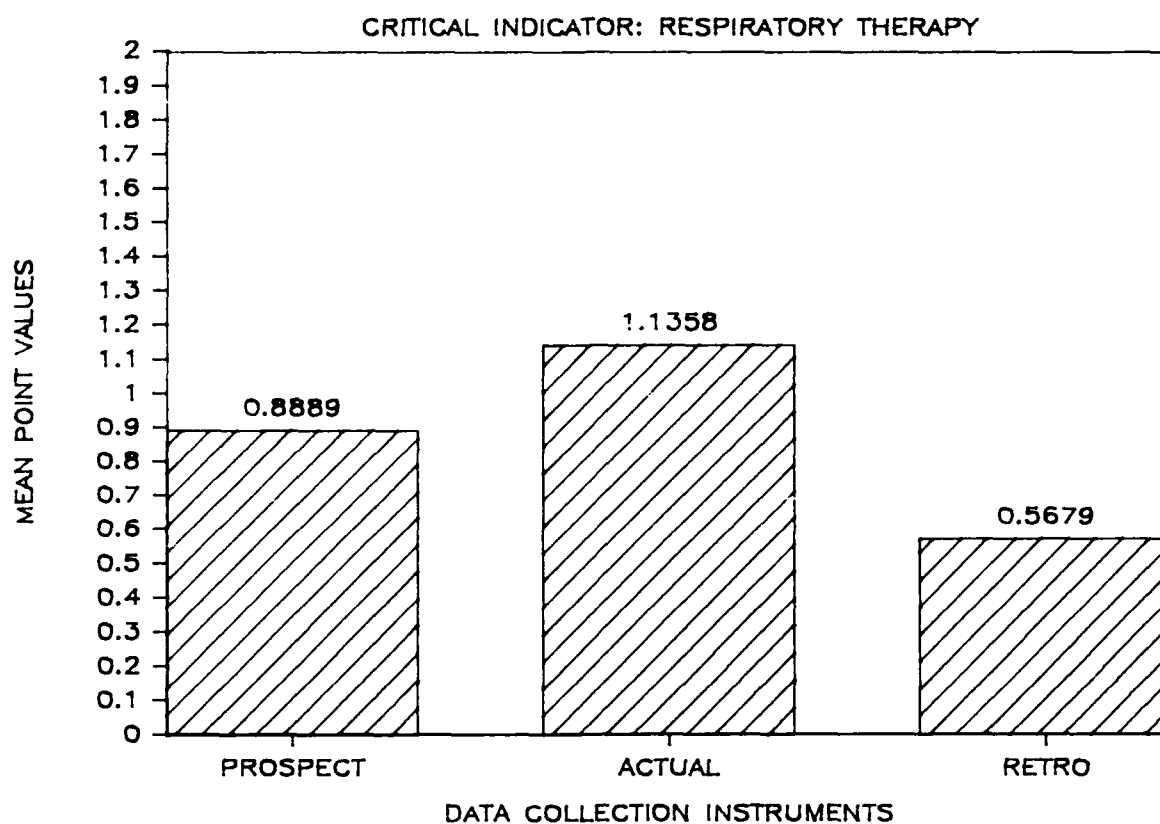
* denotes categories with significance of .05 or greater.

differences existed between the instruments on four of the PAW critical indicators and in the total overall point scores, then it was deemed necessary to determine where the significance could be found among the three classification instruments. Tukey's HSD Test was used to find where the specific significant difference fell between the three instruments. The results of the test are shown in Table 2. The results of shown on Table 2 indicate that the nursing personnel project and record similar tasks and therefore receive similar point values for workload reporting purposes. However, the point values recorded for the actual work performed on the four wards on the actual PAW's were shown to be signif-









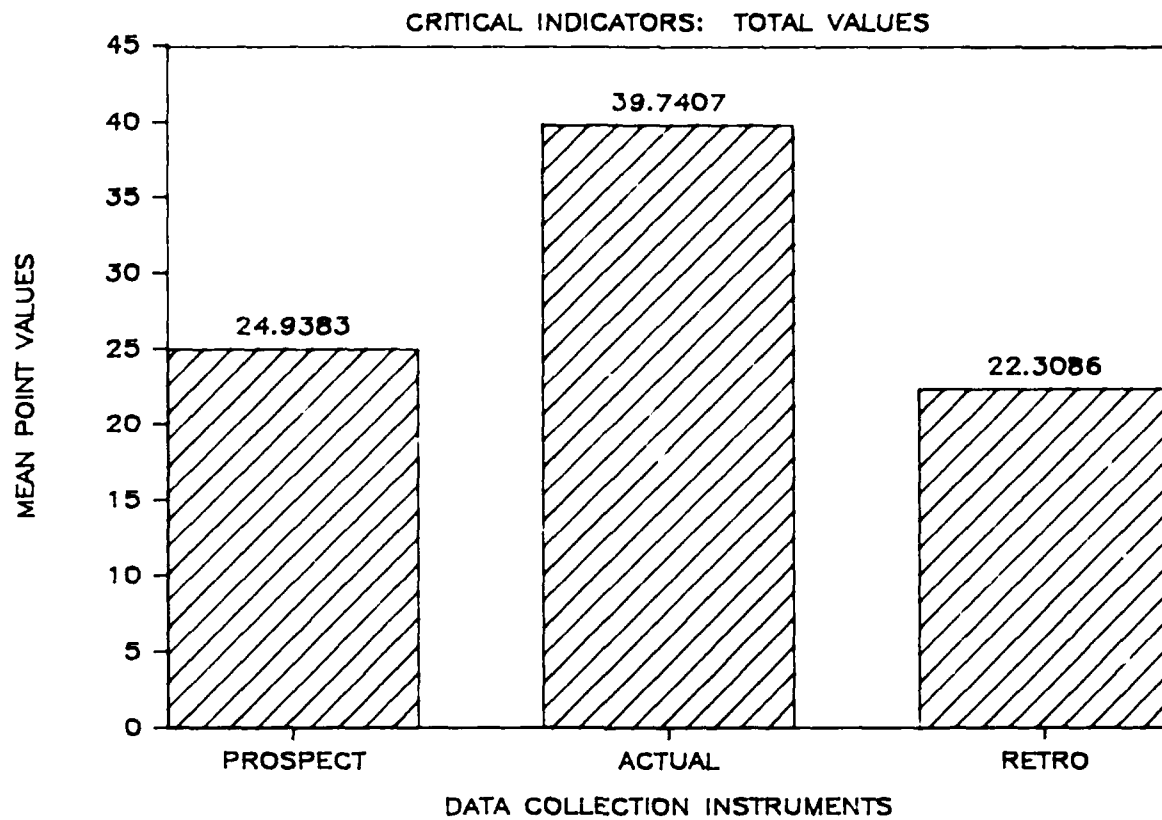


Table 2.
Summary Data of Tukey's Honestly Significant
Difference Test Means by Classification Instrument

Critical Indicator	Prospective (1)	Actual (2)	Retrospective (3)	Significant Difference By Class. Instrument
Monitoring	.5679	1.1481	.3210	2 > 1 & 3
IV Therapy	2.7407	4.8889	2.8148	2 > 1 & 3
Treatments	7.1852	9.7284	5.8519	2 > 3
Teaching	2.2716	7.6296	2.1975	2 > 1 & 3
Totals	24.9383	39.7407	22.3086	2 > 1 & 3

nificantly higher than the prospective or the retrospective PAW's indicate.

After close inspection of the data and the statistical analyses, it was evident that the actual workload data were significantly higher than the prospective or the retrospective workload data in the critical indicators of monitoring, intravenous (IV) therapies, treatments, and teaching and on the total point scores. The point values on the other critical indicators of the actual collection PAW's, while not significant at the .05 level, were still higher than the prospective or retrospective collection periods for the research project. A plausible explanation for the other critical indicators not showing significance is that the point values obtained for the other critical indicators were very small and sometimes nonexistent due to little or no treatments being ordered in the areas of monitoring, activities of daily living, feeding, and respiratory therapy. If the sample sizes could have been larger, a significant difference might possibly have been found in these areas. Clearly, the nursing personnel are not receiving credit for

the workload they are actually performing compared to the prospective and the retrospective scores, at least on the 81 patients on the four wards sampled. Why is there such a significant difference between what the nursing staff actually does and what they project prospectively or record retrospectively on the four wards sampled? Are there tasks being routinely performed by the nursing staff that they are not projecting or documenting in the nursing notes? Are the nursing personnel having difficulties in performing the written documentation of their treatments? To answer these questions, several nursing personnel were interviewed to determine the reasons for the differences and some possible solutions to explain and correct the vast differences in workload measurement.

Follow-up Interviews With Nursing Personnel

After the results of the data comparisons were analyzed, several nursing personnel both assigned and not assigned to the wards were interviewed to determine the reasons for the significant differences between the conditions in the various categories of the PAW. Some of the individuals interviewed on the ward stated that it is virtually impossible to write down or accurately account for every task they perform. Other nursing personnel stated that the orders written by the physicians on the wards can change rapidly within the 24-hour period making it difficult to prospectively know 24 hours ahead every task they will need to perform for the following 24-hour period. Still other nursing personnel stated that, with as many as 30 full-care patients or patients needing vast amounts of nursing care on the ward at one time, they must document what treatments must be performed for the patients after

their shift is over; sometimes staying as long as an hour or two after the shift is officially completed. They explained that it is very difficult to record every task they have done and their employees have done to and for the patients for the entire eight-hour shift.

The ancillary nursing staff were also interviewed. Many stated that the registered nurses do not always document the many tasks they perform on and for the patients and that it was a pleasure to have a chance to document and state what contributions they make to the overall treatment plan of the patient and the workload generated. Others stated that the registered nurses perform different functions than the ancillary nursing personnel and therefore it is difficult to communicate all the tasks performed on a patient to the personnel completing the prospective PAW's or the documented information in the medical record. Likewise, many personnel reported how difficult it is to constantly write out in longhand the treatments and the information on patients' charts. Several nursing personnel stated that, if they had a computer, it might be easier to maintain the workload information on each patient. To investigate the possible use of computers in capturing the patient acuity workload information, this researcher discussed the possibility of nursing computerization with the head nursing researcher at BAMC.

The head nursing researcher at BAMC, COL Joseph Maloney, was interviewed to find out the possible reasons for the significant findings among the prospective, the actual, and the retrospective phases of this research study. He stated that he agreed with the possible explanations voiced by the other nursing personnel at BAMC. Many tasks performed by the nursing personnel are not counted in the workload measurement because of the sheer volume of

patients to be treated and the nursing tasks needing to be performed. Generally, the nursing personnel do not have enough time to document every single task that they perform by a hand written mode of recording. A way to computerize the tasks and to alleviate the need to hand document all tasks could greatly improve the workload measurement system. COL Maloney recommended a system used by LDS Hospital in Salt Lake City, Utah, in conjunction with the Department of Medical Physics and Computing at the Medical School of the University of Utah. COL Maloney recommends the implementation of this type of clinical information system for BAMC's intensive care units (see Appendix D).

The computerized nursing acuity system uses a patient acuity information sheet similar to the PAW used in this study. However, the entire system is placed on a complex of 18 computers that support all phases of healthcare in the hospital. The computer system uses several major sources for monitoring including physiological, clinical laboratory, blood gas laboratory, pharmacy/nutrition care, radiology, and other clinical areas. It also utilizes the HELP (health evaluation through logical processing) system to assist hospital personnel in the areas of data base management, data acquisition, data retrieval, time reference data, standard ranges, nursing care plans, protocols, and suggestions on appropriate treatment regimes. All patient information can be quickly stored and printed out whenever it is needed. The use of the computer system negates the need for the patient record in written form. The system ultimately saves the hospital time and money and allows hospital personnel to spend more time with actual patient care (Gardner, West, Pryor, Larsen, Warner, Clemmer, & Orme, 1982).

An interesting aspect of this computer program is that its creators

have made the computer program part of public domain. In this way, a hospital can request a copy of the computer program at little or no cost except the cost of the labor and the shipping of the software program. A hospital would need to have the hardware in place which could accept the software to be used in the hospital. The low to no cost of the software and its versatility makes this an extremely attractive computer enhancement to any hospital's information system.

Summary

A significant difference was found between the prospective, the actual, and the retrospective patient classification instruments of the research. In four out of eight critical indicators significant difference were found at the .05 level on the actual PAWs compared to the prospective and the retrospective PAWs of the 81 patients surveyed. The patient acuity and workload generated to treat the 81 patients was shown to be significantly higher in the four critical indicators of monitoring, IV therapy, treatments, and teaching as well as the total scores of all critical indicators on the actual PAW as compared to the other workload reporting instruments.

Interviews conducted with the nursing personnel showed them to be in agreement concerning the lack of time to document the patient workload and the use of computers to improve the documentation. Generally, the nursing personnel believed that they were performing more work than was demonstrated on the prospective PAW or documented in the patients medical record. The head nursing researcher at BAMC did provide information on the reasons for the significant differences as well as a possible solution that of using a

particular computerized hospital system.

CHAPTER III

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the research findings on the four wards surveyed that there was a significant difference among the prospective, the actual, and the retrospective recording of the nursing workload on the PAWs, it was concluded that a method is needed to accurately collect the entire information on patient acuity and workload. The research on the four wards based on the three types of collection instruments indicated that the nursing personnel actually give more nursing care to the patients than the prospective or the retrospective instrument indicates. An obvious under-reporting of nursing workload was found on the four wards studied. Significant differences were found in the four critical indicators of monitoring, IV therapy, treatments, and teaching as well as in the overall total of all the critical indicators. In addition, the actual values in the other four critical indicators, while not significant at the .05 level, were higher than the prospective or the retrospective scores. The statistics clearly demonstrate that the nursing personnel on the four wards observed are not receiving workload credit for all the tasks being performed.

Through interviewing the various nursing personnel, it was discovered

that many nurses agree the actual work performed is much higher than that shown prospectively on the PAWs or retrospectively in the patient record. Most nursing personnel believe that the lack of time to document the workload and the volume of work are the critical factors that prevent them from accurately accounting for the workload performed. Several studies cited earlier have concluded that documentation of workload is a key factor in accurately determining the amount of nursing care needed to treat the hospitalized patients (e.g. Cherkin & Gillanders, 1984, Ebener, 1985, and Giovannetti & Mayer 1984). The amount of time nursing personnel use to document all patient workload is considerable and tedious. Many studies have demonstrated that the computer is an excellent tool to efficiently and effectively aid hospital personnel in performing the necessary functions of their positions (e.g. Adams & Duchene, 1985, Affeldt, 1983, Affeldt, 1984, Bernzweig, 1985, Edmunds, 1982, and Packer, 1985). The nursing personnel interviewed at BAMC and at HCSCIA, all agreed that a computerized nursing system could help to improve the efficiency and accuracy in documenting the inpatient workload. In addition to this improved efficiency, the the nursing personnel could integrate the nursing portion of the patients medical record with information on the patient from the other clinical services in the hospital.

Recommendations

The recommendations presented are based on the findings of the research data, the nursing interviews and on the information contained in the literature obtained. First, due to the sample size of 81 and the use of only

four wards at BAMC, it is recommended that several more studies be performed at BAMC and at other Army medical centers to replicate the study conducted by this researcher. Additionally, a study should be conducted to determine if a computerized system would greatly improve the workload collection at BAMC. A research study could be devised by purchasing a minimum of three or four microcomputers and using a form of the PAW as software to document workload and patient acuity to compare the manual versus the computerized system.

Another recommendation would be to send a team of nursing researchers from HCSCIA or BAMC to further investigate the system used at LDS Hospital in Utah and obtain a copy of the computer program which could be placed into BAMC's automated computer information system. The use of this and other computerized systems could be an invaluable aid to providing the needed patient documentation in the healthcare system. The implementation plan for use of a computer system for BAMC's intensive care unit as shown in Appendix D was developed by COL Maloney and other BAMC researchers and could be expanded to the entire medical center. In this way, nursing workload and patient acuity could be accurately monitored and updated instantly with information from all clinical departments of the medical center.

APPENDIX A

Definitions

Nursing workload--The quantitative measure of nursing tasks performed in the treatment of inpatients based on the Navy and Army's workload management system.

Patient classification--The grouping of patients according to some predetermined criteria based on patient characteristics and treatment needs.

Prospective period--The period of the research study where data were collected using a patient acuity worksheet based on physicians' orders and nursing care plans as to what treatments would be accomplished during the ensuing 24-hour period.

Actual period--The period of the research study where data were collected using a patient acuity worksheet based on what treatments were actually performed on a particular patient during a 24-hour period.

Retrospective period--The period of the research study where data were collected using a patient acuity worksheet based on what treatments were recorded in the patient's inpatient record during a 24-hour period.

Patient Acuity Worksheet (PAW)--A patient classification tool designed by research conducted by the Navy and the Army to accurately measure the nursing care needed to be provided a patient and to categorize a patient into a particular grouping based on the patient classification system. The patient acuity worksheet divides the nursing tasks into eight critical indicators and provides point values equivalent to one point for each nursing care minute of treatment given for each patient. The PAW also indicates a total score and allows the patient to be classified into various categories of care from

the lowest to the highest acuity or level of severity of illness.

Prospective Concurrent Patient workload Classification System

(PCPWCS)-- The patient classification system currently used in BAMC where head nurses on each ward prospectively collect patient workload data at the beginning of the 24-hour patient treatment period which starts at 7:00 am one morning and ends 7:00 am the next following day.

APPENDIX B

PATIENT ACUITY WORKSHEET					NAME OF PATIENT											
For use of this form, see HQDA LTR 40-85-6, the proponent agency is the OTGS.																
NAME OF HOSPITAL			UNIT													
SIGNATURE			DATE & TIME													
Point Values	CRITICAL INDICATORS		Acuity Code													
VITAL SIGNS (MANUAL TPR, BP)				A1-A3												
1)	Vital signs qid or less		1													
2)	Vital signs q4h or x 6		2													
4)	Vital signs q2h or x 12		3													
8)	Vital signs qid or x 24		4													
2)	Rectal or axillary temp or epical pulse qid or more		5													
2)	Femoral or pedal pulses or FHT q4h or more		6													
2)	Tilt tests q4h or more		7													
6)	Post-op, post-partum, post-delivery (Infants)		8													
3)	Vital signs q3h or x 8		9													
MONITORING				A3-A7												
2)	Intake and output q8h		20													
8)	Intake and output q2h		21													
2)	Circulation or fundus checks q2h or x 12		22													
3)	Neuro checks q4h or x 6		23													
6)	Neuro checks q2h or x 12		24													
2)	CVP or ICP (manual) q2h or x 12		25													
6)	Cardiac/spine/temp/pressure monitors (not cumulative)		26													
6)	Transcutaneous monitor		27													
4)	A-line or ICP monitor or Swan Ganz set-up		28													
2)	A-line or ICP (monitor) reading q2h or x 12		29													
2)	PAP/PA wedge reading q4h or x 6		30													
4)	PAP/PA wedge reading q2h or x 12		31													
2)	Cardiac output tid		32													
ACTIVITIES OF DAILY LIVING				A7-A15												
6)	Infant/toddler care (< 5 years)		40													
2)	Self/minimal care (adult or child > 5 years)		41													
8)	Assisted care (> 5 years) - position self		42													
12)	Complete care (> 5 years) - assist with positioning		43													
32)	Total care (> 5 years) - position and skin care q2h		44													
4)	Extra linen change and partial bath 2x per shift		45													
14)	Turning frame (2 staff to turn q2h)		46													
8)	Peds recreation/observation (0-12 years) (exclude NBN)		47													
FEEDING				A16-A17												
3)	Tube feed adult/child/neonate q4h or x 6 (Bolus)		50													
10)	Tube feed adult/child/neonate q2h or x 12 (Bolus)		51													
6)	Adult meals > 5 years (spoon feed x 3)		52													
10)	Child meals < 5 years (spoon feed x 3)		53													
2)	Infant/neonate bottle x 1 feeding		54													
12)	Infant/neonate bottle q4h or x 6		55													
24)	Infant/neonate bottle q2h or x 12		56													
8)	Tube feed adult/child/neonate q3h or x 8 (Bolus)		57													
2)	Tube feed (continuous) per bottle change		58													
IV THERAPY				A30-A33												
4)	KVO (change bottle bid or less)		60													
4)	Heparin lock or Bivac		61													
6)	Simple (change bottle tid or qid)		62													
9)	Complex (2 or more sites or change bottle q4h)		63													
2)	Medication q8h or x 3		64													
3)	Medication q6h or x 4		65													
4)	Medication q4h or x 6		66													
2)	S and products each administration		67													
SUBTOTAL POINT VALUES																

APPENDIX C

MODIFIED ACUITY WORKSHEET

PATIENT NAME:

SHIFT

34

PATIENT ACUITY WORKSHEET			DAY				EVENING				NIGHT			
For use of this form, see HQDA LTR 40-88-8, the predecessor agency is the OTGS.														
NAME OF HOSPITAL		UNIT												
SIGNATURE		DATE & TIME												
Point Value	CRITICAL INDICATORS	Acuity Code												
VITAL SIGNS (MANUAL TPR, BP)			A1-A3											
1)	Vital signs	1									1			
2)	Vital signs	2									2			
4)	Vital signs	3									3			
8)	Vital signs	4									4			
2)	Rectal or axillary temp or apical pulse	5									5			
2)	Peroral or pedal pulses or PHT	6									6			
2)	Tib temp	7									7			
6)	Post-op, post-partum, post-delivery (infants)	8									8			
3)		9									9			
MONITORING			A3-A7											
2)	Intake and output	20									20			
8)	Intake and output	21									21			
2)	Circulation or fundus checks	22									22			
3)	Neuro checks	23									23			
8)	Neuro checks	24									24			
2)	CVP or ICP (manual)	25									25			
8)	Cardiac/resp/temp/pressure monitors (not cumulative)	26									26			
8)	Transcutaneous monitor	27									27			
4)	A-line or ICP (monitor) or Swan Ganz set-up	28									28			
2)	A-line or ICP (monitor) reading	29									29			
2)	PAP/PA wedge reading	30									30			
4)	PAP/PA wedge reading	31									31			
2)	Cardiac output	32									32			
ACTIVITIES OF DAILY LIVING			A7-A15											
8)	Infant/toddler care (< 5 years)	40									40			
2)	Self/minimal care (adult or child > 5 years)	41									41			
8)	Assisted care (> 5 years) - position self	42									42			
14)	Complete care (> 5 years) - assist with positioning	43									43			
22)	Total care (> 5 years) - position and skin care	44									44			
4)	Extra linen change and perineal bath	45									45			
14)	Turning frame 12 staff to turn	46									46			
8)	Peds recreation/observation (0-12 years) (exclude NBN)	47									47			
FEEDING			A16-A17											
5)	Tube feed adult/child/neonate (Bolus)	50									50			
10)	Tube feed adult/child/neonate (Bolus)	51									51			
8)	Adult meals > 5 years (spoon feed)	52									52			
10)	Child meals < 5 years (spoon feed)	53									53			
2)	Infant/neonate bottle & feeding	54									54			
12)	Infant/neonate bottle	55									55			
24)	Infant/neonate bottle	56									56			
8)	Tube feed adult/child/neonate (Bolus)	57									57			
2)	Tube feed (continuous) per bottle, range	58									58			
IV THERAPY			A30-A 32											
4)	KVO (change bottle)	60									60			
4)	Heparin lock or Brevloc	61									61			
6)	Simple (change bottle)	62									62			
8)	Complex (2 or more sites or change bottle)	63									63			
2)	Medication	64									64			
3)	Medication	65									65			
4)	Medication	66									66			
2)	Blood products (each add 10% to 67)	67									67			
SUBTOTAL POINT VALUES														

POINT VALUE	CRITICAL INDICATORS	AUCITY CODE
	TREATMENTS/PROCEDURES/MEDICATIONS A17-A23	
	Summary > 18 and ≤ 30 minutes Total:	
2)	Start IV or NG or Foley or SKG	70
2)	OR care or enemas or eye washes/rinses	71
2)	Bubble dressing or tube care, Foley care (exclude fresh)	72
2)	E&A or SeQr or Gules or skin HCT	73
2)	Lab studies x 6 ABG or blood culture	74
2)	Medications (exclude IV)	75
2)	Irrigations or instillations x 4 or less	76
2)	Restraints (2 or 4 point or restry)	77
2)	Admin OOB to chair/stretching x 3	78
2)	Admin OOB, walk & return x 1	79
2)	Infirm circumlocution or phototherapy	80
2)	Accompany patient off ward > 15 minutes and ≤ 30 minutes	81
2)	Other activities requiring > 15 minutes and ≤ 30 minutes	82
2)	Toileting (gown and glove)	83
	Comeals > 30 minutes and ≤ 1 Hour Total:	A24-A25
4)	Chest tube insertion or lumbar puncture	90
4)	Thoracentesis or paracentesis	91
4)	Complex dressing change 30 minutes to complete)	92
4)	Straight catheterization x 4 or more	93
4)	Medication (exclude IV)	94
4)	Range of motion exercises x 3	95
4)	Accompany patient off ward > 30 minutes	96
4)	Other activities requiring > 30 minutes and ≤ 1 hour	97
	Special Procedures > 1 Hour and ≤ 4 hrs	
8)	Each hour requiring continuous staff attendance/assistance	100
12)	New Admission (assessment and orientation)	101
4)	Transfer (in-house)	102
	RESPIRATORY THERAPY A27-A30	
2)	Oxygen therapy or oxymed	110
2)	Incentive spirometer or C&DS	111
2)	IPPB or maximil	112
4)	IPPB or maximil	113
6)	IPPB or maximil	114
8)	Croup tent or mist tent	115
2)	Chest pulmonary therapy	116
4)	Chest pulmonary therapy	117
6)	Chest pulmonary therapy	118
2)	Suctioning	119
4)	Suctioning	120
10)	Ventilator	121
4)	Tracheostomy care	122
	TEACHING & EMOTIONAL SUPPORT (Must be documented) A33-A35	
2)	Group teaching	130
4)	Preoperative teaching	131
4)	Special structured teaching (diabetic, exercise, etc.)	132
	EMOTIONAL SUPPORT (in excess of 30 min)	
4)	Patient/family support (anxiety, grief, loss, etc.)	133
4)	Lifestyle modification (dietary, behavior, image, etc.)	134
6)	Sensory deprivation (deaf, blind, etc.)	135
10)	Maximum points for emotional support	136
	CONTINUOUS A36-A38	
80)	Patient requiring 1:1 coverage all shifts	140
140)	Patient requiring greater than 1:1 coverage all shifts	141
0-12 I _____ 64-95 IV _____ 13-31 II _____ 96-149 V _____ 32-63 III _____ 150-999 VI _____	SUBTOTAL TOTAL CATEGORY	

APPENDIX D

SUBJECT: Clinical Information System Planning For Brooke Army Medical Center

1. A three phase implementation of a clinical information system at Brooke Army Medical Center is presented. Recommendations regarding personnel, policy, and (where applicable) additional equipment needs are made for each phase. Basic equipment and software needs for clinical and other functions will be addressed by CPT Weber, or have been discussed previously.

2. INITIAL PHASE (Year 1)

a. ICU SHIFT REPORTING in the Special Care Areas. These should be menu driven, provide hard copy documentation of care and consist of the following data:

(1) Serial heart rate, blood pressure, temperature, respiratory, and hemodynamic data displayed in graphic and tabular form as an automated function;

(2) Concise intake and output data tabulated by type and quantity entered by nursing personnel using a menu driven program;

(3) Medication type, amount, route and time given. This data should have menu driven entry by nursing personnel. This should replace the Nursing Therapeutics Documentation sheet for medications,

(4) All STAT laboratory results obtained including chemistries, hemotologic, coagulation values (SMA-6, Creatinine, urine lytes, magnesium, calcium, phosphorus, bilirubin, amylase, CPK, PT, PTT, CBC) and any stat drug levels obtained. Initially these will require menu driven hand entry by laboratory personnel;

(5) Respiratory therapy data included blood gas results, ventilator settings and treatments. These data should be entered from menu driven program by respiratory therapy and should replace all respiratory therapy ventilator sheets and care documentation sheets in the special care areas;

(6) Initial height and weight, with new weight (if measured during shift) and calculation of new body surface area;

b. 24 HOUR ICU ROUNDS. Report generated automatically at 0400 daily. This should consist of tabulated 24 hours data including total medications and amounts, cardiovascular/hemodynamic data, respiratory/blood gas data, renal/fluids/lytes data, infectious data, gastrointestinal/liver/pancreas data, x-ray data, and tubes/lines data. The report should allow space for exam data, culture results, and comments as necessary. Although this will not replace physicians progress note, it should nonetheless be included as a permanent part of the record for hard copy documentation of essential patient data.

c. INITIAL PHASE Recommendations.

(1) Exception to policy from PAD to allow shift and ICU rounds reports to become part of permanent record.

(2) Marquette must arrange microprocessors in a "cluster arrangement on the same network with laboratory, blood gas lab, radiology, etc.

(3) Initiation of software/hardware necessary to bring stat laboratory, blood gas laboratory, radiology on line.

(4) ICU radiographs must receive priority treatment by radiology with dictated results entered into the systems in same day fashion.

(5) Need for one ward clerk per shift in all intensive care units.

(6) Contract for five computer technicians to supply 24 hours per day seven day per week support of Beach and Main for system education and system trouble shooting.

(7) Purchase of one PDMS Computer with terminals and software for the PICU.

(8) Linkage of NICU to extra PDMS capabilities on Ward 42A and Beach OR and supply NICU with terminals.

(9) Sequential implementation - Begin with 13A, followed by 42A, 42B, PICU, MICU, Labor and Delivery, NICU.

3. INTERMEDIATE PHASE (Years 2-3)

a. Pharmacy: In addition to internal needs of the pharmacy the following are necessary:

- (1) Bring on line for medication orders and medications sent;
- (2) Nutritional assessments, therapy, and metabolic monitoring;
- (3) Drug alerts/allergy monitoring

b. Laboratory: Automated function and transfer of data from all Pathology areas including:

- (1) Chemistry
- (2) Radioimmunoassay/toxicology/drug level
- (3) Hematology and special hematology

(4) Microbiology

(5) Blood Bank

c. Microcomputers on all medical/surgical nursing units including special care units. Nursing functions to be accomplished include:

(1) Charting;

(2) Nursing Care Plan;

(3) Staffing/Scheduling;

(4) Activity Index/Workload Data,

d. TRI-RAD system on line to automate entry of radiology data.

e. centralize all integration functions through IMO including integration with cardiology; and departmental administrative systems.

f. Refine and add to report formats.

g. INTERMEDIATE PHASE Recommendations

(1) Hiring of Data-entry personnel for pharmacy, laboratory, Med-surg units.

(2) Contract additional 5 computer technicians (Total 10)

(3) Contract three computer programmers.

(4) Purchase of additional work stations - need approximately 100.

4. FINAL PHASE (Years 4 and 5)

a. All data will be stored on laser discs with all data backed up at user level. This includes discharge summaries from previous admissions.

b. Develop interfaces with medical machines (ventilators, oximeters, IMEDs, etc) to automatically enter data into PDMS.

c. Develop interfaces with other facilities such as Wilford Hall.

d. Develop voice activated devices for security and ease of data entry.

e. Develop decision making software.

f. Continue to refine clinical information system thus creating an electronic chart.

g. FINAL PHASE Recommendations

(1) Sharing of software developed at other facilities such as Wilford Hall and ATC

(2) Continued support by personnel noted in initial and intermediate phase.

(3) Contract a full time biophysicist.

(4) Appropriate purchase of laser discs/memoray tapes devices and voice activated devices when available.

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